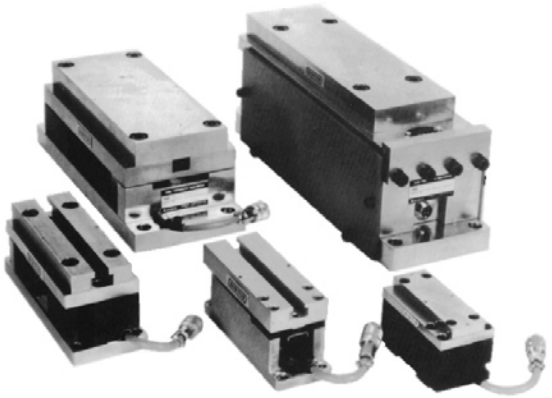
nexen™

WEB CONTROL PRODUCTS

User Manual



MB Tension Sensor

FORM NO. L-20127-H-0109

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900

www.nexengroup.com

DANGER

Read this manual carefully before installation and operation.

Follow Nexen's instructions and integrate this unit into your system with care.

This unit should be installed, operated and maintained by qualified personnel ONLY.

Improper installation can damage your system or cause injury or death.

Comply with all applicable codes.

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Vadnais Heights, Minnesota 55127

ISO 9001 Certified

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THEORY OF OPERATION

MB Tension Sensors are available in seven force ranges, divided into five frame sizes: MB05, MB11, MB25, MB33, and MB41. MB05, MB11, MB25, and MB33 utilize a torsion bar for both Pivot Point and load resistance. Because of the greater forces involved, MB41 utilizes a conventional resistance spring type construction rather than the torsion bar.

MB05, MB11, MB25, and MB33

Force applied perpendicular to the Load Plate causes the plate to rotate about the Pivot Point (See Figure 1). This movement causes a change in the position of the Core within the coil of the LVDT (Linear Variable Differential Transformer). The coil is excited by input voltage from the Tension Controller or Tension Meter. Its output varies directly with any change in Core position. Movement of the Load Plate is opposed by a torsion bar, which also forms the Pivot Point.

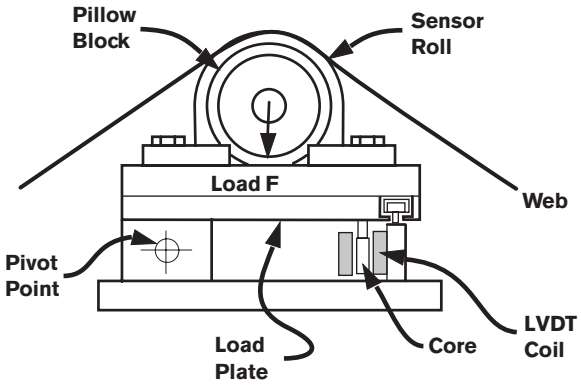

FIGURE 1

MB41

Force applied perpendicular to the Load Plate causes the plate to rotate about the Pivot Point (See Figure 2). This movement causes a change in the position of the Core within the coil of the LVDT (Linear Variable Differential Transformer). The coil is excited by the input voltage from the Tension Controller or Tension Meter. Its output varies as the position of the Core changes. The movement of the Load Plate is opposed by the Main Spring which is connected to the Load Plate by the Transmission Plate.

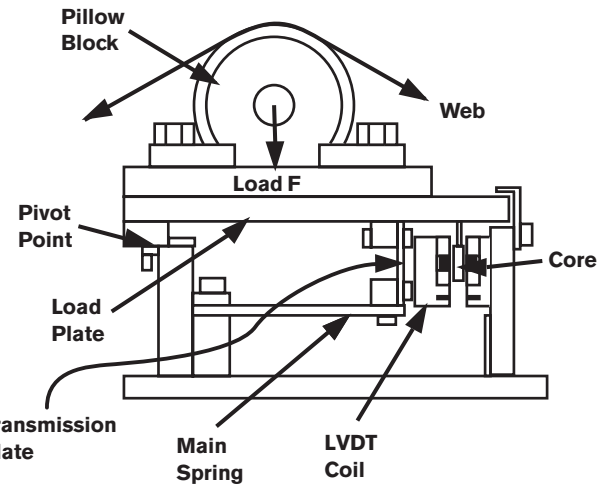

FIGURE 2

MB TENSION SENSOR LOCATION

Figure 3 illustrates correct MB Tension Sensor location for winding or unwinding control. One transport roll **A** located between the MB Tension Sensors and roll stand serves to fix the web angle over the Sensor Roll.

Figure 4 illustrates angular changes as the roll changes diameter during processing, if roll A is not used. These angular changes will cause incorrect readings from the MB Tension Sensors and must be avoided by use of roll **A** (See Figure 3).

Figure 5 illustrates a common mistake in MB Tension Sensor mounting. In this configuration, the **S** Wrap Drive will effectively isolate tension into two zones, $\mathbf{T}_1$ and $\mathbf{T}_2$ (A nip roll at the same position would provide the same isolation). The roll stand brake or clutch can only control tension in the $\mathbf{T}_1$ zone. Since the MB Tension Sensors are mounted in the $\mathbf{T}_2$ zone, they cannot sense any tension changes caused by the roll stand and can not be used for closed loop control. The MB Tension Sensors must be moved to position **A** for proper control of the roll stand and $\mathbf{T}_1$ tension.

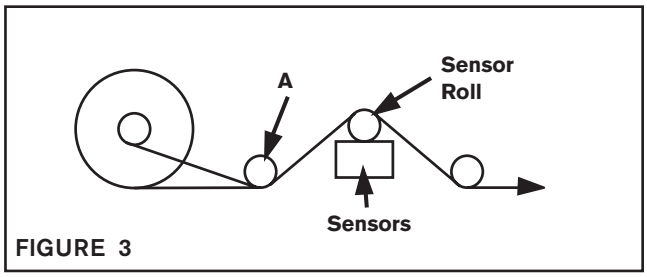

FIGURE 3

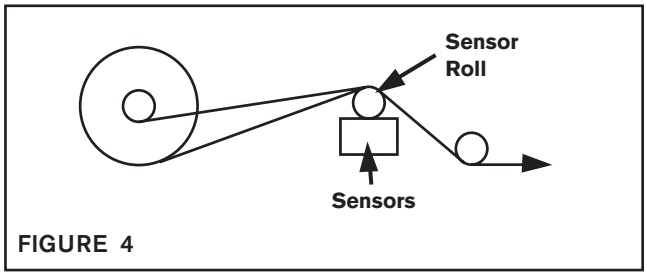

FIGURE 4

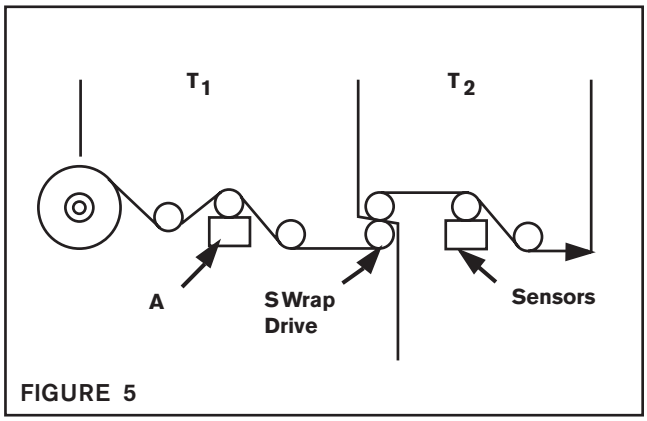

FIGURE 5

MB TENSION SENSOR MOUNTING

Mounting dimensions for the four frame sizes are given in MOUNTING DIMENSIONS, Pages **8** - **10** (See Figures 13-17).

MB Tension Sensors MB05, MB11, and MB25 may be mounted at any angle (See Figure 6). MB33 and MB41 should be mounted to a rigid horizontal or near horizontal surface.

All MB Tension Sensors must be mounted according to the following guidelines:

- Flatness must be 0.002" [0.05 mm] over the length of the MB Tension Sensor. This can be achieved by milling of the mounting surface.

NOTE

Any shimming required for Sensor Roll leveling must be done between the MB Tension Sensor and pillow block. Never shim between the MB Tension Sensor and MB Tension Sensor mounting surface.

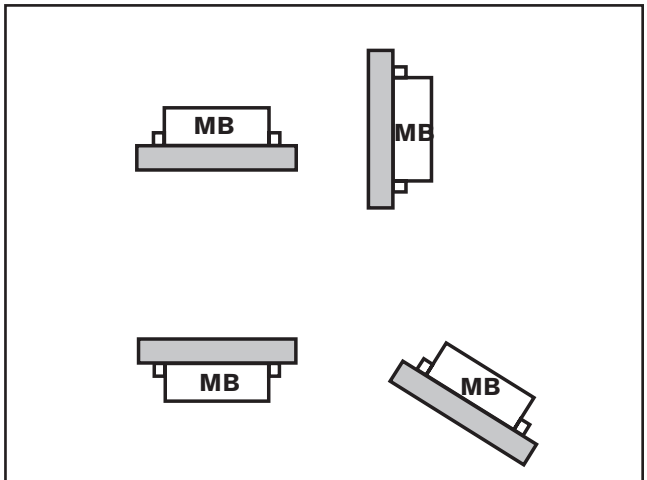

FIGURE 6

(continued...)

INSTALLATION (continued...)

- Sensor Roll span must equal sensor span. This is achieved by securing the MB Tension Sensor to the mounting surface, then the Pillow Block Bearings to the MB Tension Sensors, and finally the bearings to the Sensor Roll shaft (See Figure 7).

- When MB Tension Sensors are mounted to a base of material different than that of the Sensor Roll, i.e., aluminum roll, steel mounting base; secure only one Pillow Block Bearing to the roll shaft. This will allow for different rates of thermal expansion (See Figure 7).

- Mounting surfaces must be parallel to one another. Self centering Pillow Block Bearings are required to take up any variations in parallelism (See Figure 8).

WARNING

Non-compliance with the above conditions will induce heavy side loads within the MB Tension Sensor. This will cause hysteresis, and the MB Tension Sensor will measure mechanical resistance rather than tension load. In extreme cases it will mechanically damage the MB Sensors.

- MB05 is normally mounted using the sidewall mounting plate and cap screws provided.

- A side wall mounting bracket for the MB11 is available from Nexen. The part number is 31084.

NOTE

Due to the high forces generated, a side wall mounting bracket is not recommended for MB Tension Sensors MB33 and MB41. Mount these MB Tension Sensors to a rigid horizontal or near horizontal surface.

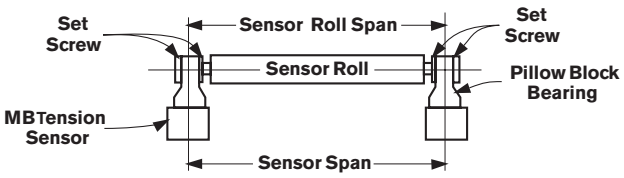

FIGURE 7

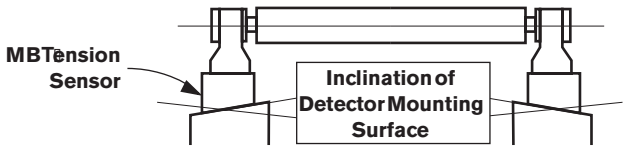

FIGURE 8

ELECTRICAL CONNECTIONS

Use 16 Ft. [5 m] cables provided with MB Tension Sensors to make connections with Tension Controller, Tension Amplifier or Tension Meter.

NOTE

If you are using a Nexen controller, refer to the appropriate instruction manual. For all other controllers, see Figure 9.

Cables may be extended up to 500 Ft. [156 m] with customer supplied four conductor 18 AWG shielded cable. Be certain to maintain continuity of shield when splicing cable. Longer cables (30, 50, 75, and 100 Ft.) are available from Nexen if an unspliced cable is required (See REPLACEMENT CABLE ASSEMBLIES, Page **9**).

NOTE

When using MB05, MB11, or MB25 in reverse wrap, switch yellow or white and green wires at the Tension Controller or Tension Meter (See appropriate instruction Manual).

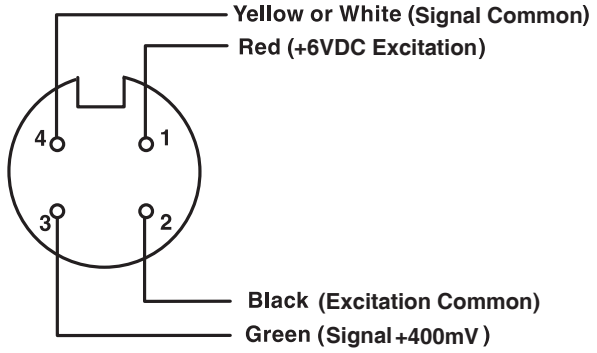

FIGURE 9
FRONT VIEW OF CONNECTOR

SENSOR ROLL

The Sensor Roll, which transfers the force generated by web tension to the MB Tension Sensors, may be made of any material compatible with the materials being handled and the system requirements. Dimensional considerations for designing the Sensor Roll are length and diameter. The length of the roll should be short enough to allow for some lateral adjustment when installing the roll between the bearings. The diameter must be designed to accommodate web speed and bearing life.

Weight may also be a design factor, particularly when dealing with very low web tensions. In low tension systems, a heavy roll may cause false tension readings. Bearings selected for low tension systems should have low frictional resistance for the same reason.

Unbalance in the Sensor Roll is picked up by the MB Tension Sensors, causing false readings. Dynamically balance the Sensor Roll to tolerance as shown (See Figure 10). The upper line indicates minimum acceptable balance specification. The lower line indicates practical balance limits (balance to closer tolerances is not cost effective).

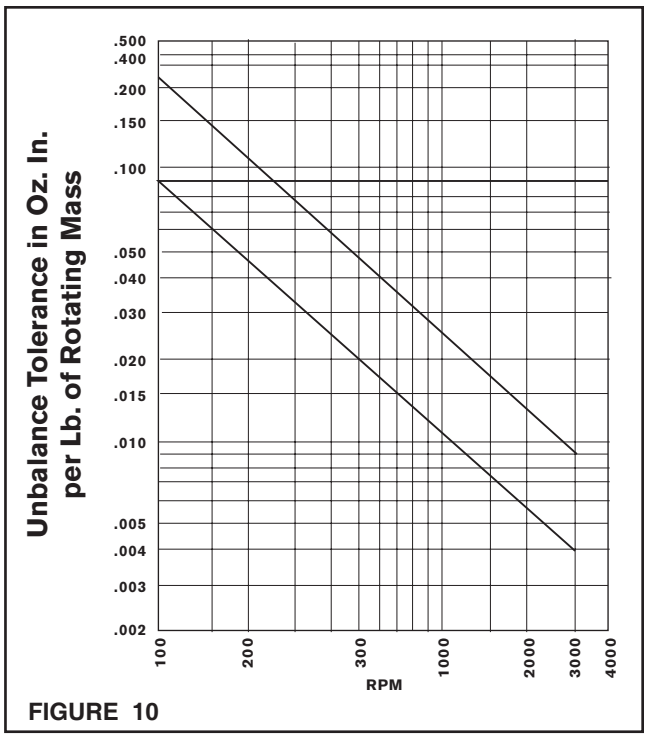

FIGURE 10

SIZING SENSORS

MB Tension Sensors are sized in reference to two forces. The force exerted on the sensor by the web, calculated as **F** or **F'** (See Page **5**). This force is divided by the number of support points (which is normally two) for the Sensor Roll. In cases of narrow web or wire being detected by a pulley or narrow roll entirely supported by one MB Tension Sensor, there is only one support.

The other force to be considered is the weight of the roll and bearings. Both of these forces should be compared to the permissible ranges as stated in the specifications section (See Page **9**).

The selected sensor must be able to tolerate both the load (**F** or **F'**) and the tare (roll and bearing weight) applied to it.

TARE FORCES

Weight of Sensing Roll W _____

Weight of Bearing B _____

Total TARE = W_____+2xB_____=_____

$\frac{\text{TARE}}{2} = \frac{\quad}{2} =$ _____ TARE per Sensor

WEB FORCES

Web angle is the angle between the plane of the web as it approaches the Sensor Roll and the plane of the web as it leaves **X** + **Y** or **X'** +**Y'** (See Figure 11), **A** + **B** or **A'** + **B'** (See Figure 12). Maximum web angle is 150°; minimum web angle is 0°.

All MB Tension Sensors may be mounted with the web angle in the Normal Wrap direction; i.e., the resultant force **F** is toward the MB Tension Sensors (See Figures 11 and 12).

MB Tension Sensors MB05, MB11, and MB25 may also be mounted with Reverse Wrap; i.e., the resultant force **F'** away from the MB Tension Sensor (See Figures 11 and 12). Web may travel in either direction.

NOTE

Due to the high forces generated by webs needing MB Tension Sensors MB33 and MB41, Reverse Wrap is not recommended.

(continued...)

SYMMETRICAL WRAP (See Figure 11)

When angle **X** = angle **Y**, or **X'** = **Y'**, the web angle is symmetrical. The resultant for **F** or **F'** will act into or away from the top plate or MB Tension Sensor at 90°. In this condition, **F** or **F'** can be determined by the formula:

For Normal Wrap

Where: **F** = Resultant Force.
T = Web Tension.

F = 2T cos X

For Reverse Wrap

Where: **F'** = Resultant Force.
T' = Web Tension.

F' = 2T' cos X'

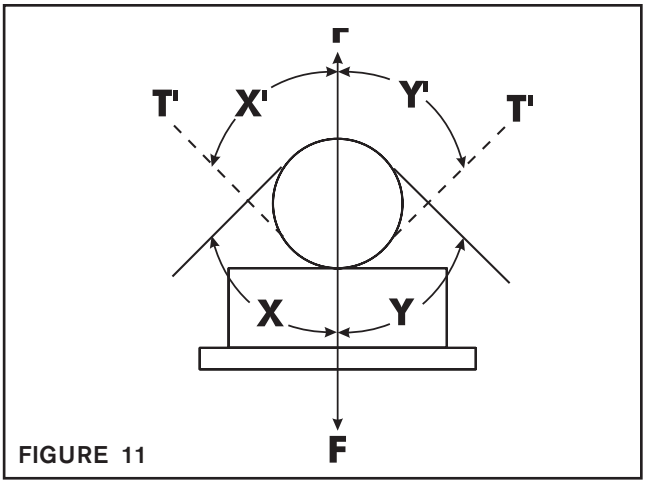

FIGURE 11

ASYMMETRICAL WRAP (See Figure 12)

When angle **A** is less than angle **B**, or angle **A'** is less than **B'**, the web angle is asymmetrical. The force acting perpendicular to the top plate can be computed from the following formulae:

Wrap Angles (Check appropriate boxes.)

Angle **a** = 90°

Angle **A** or **A'** = _____°

Angle **B** or **B'** = _____°

Angle **A**- **B**; or **A'** - **B'** = **D**°

_____° - _____° = ± _____**D**°

NOTE
If D° is > 25°, consult factory. If D° is < 25°, proceed with force calculation.

For Normal Wrap

Where: **F** = Resultant Force.
T = Web Tension.

F = (T cos A) + (T cos B)

_____+_____=_____

For Reverse Wrap

Where: **F'** = Resultant Force.
T' = Web Tension.

F' = (T' cos A') + (T' cos B')

_____+_____=_____

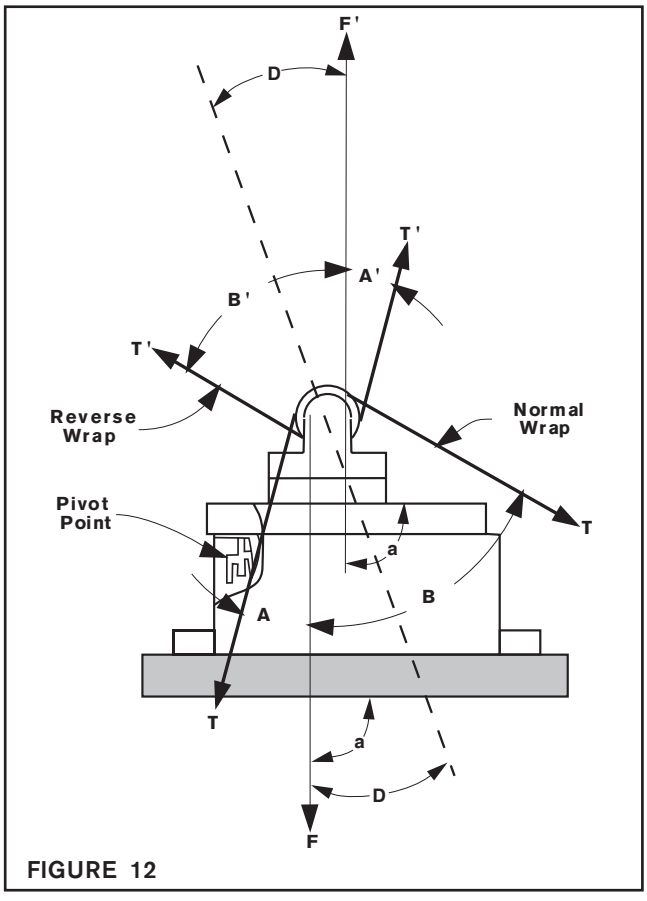

FIGURE 12

NOTE
When installing MB Tension Sensors with asymmetrical wrap, angle A must be on the same side as the Pivot Point or angle A' must be on the side away from the Pivot Point.

MOUNTING DIMENSIONS

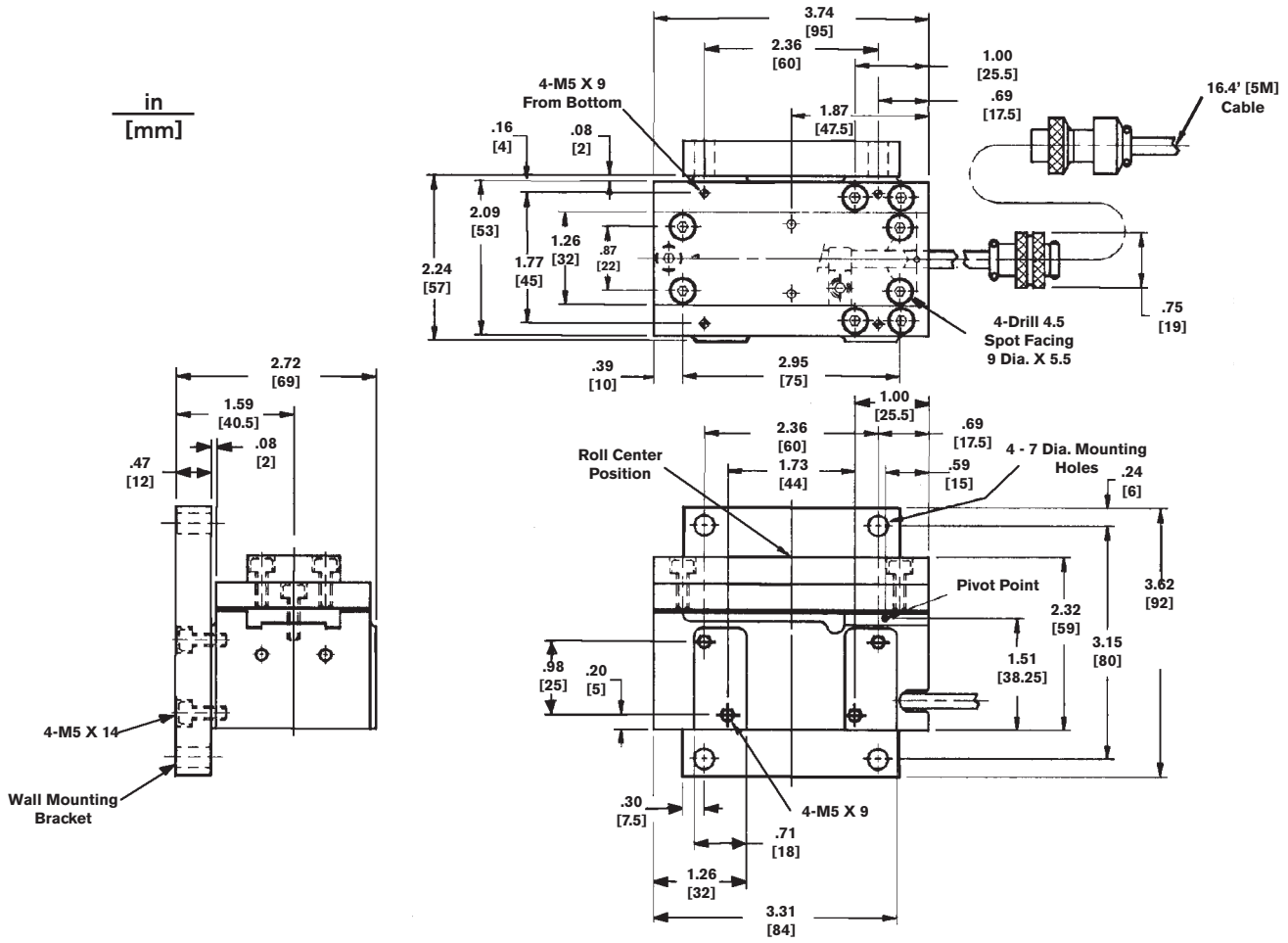

FIGURE 13
MB05

(continued...)

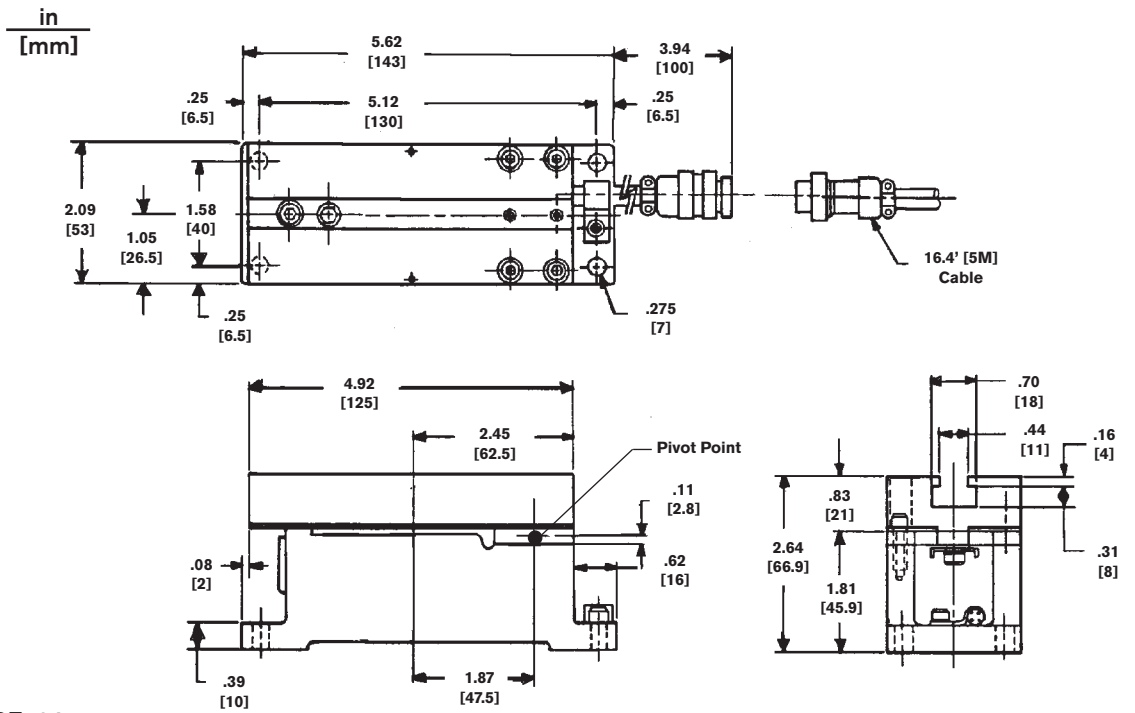

FIGURE 14
MB11

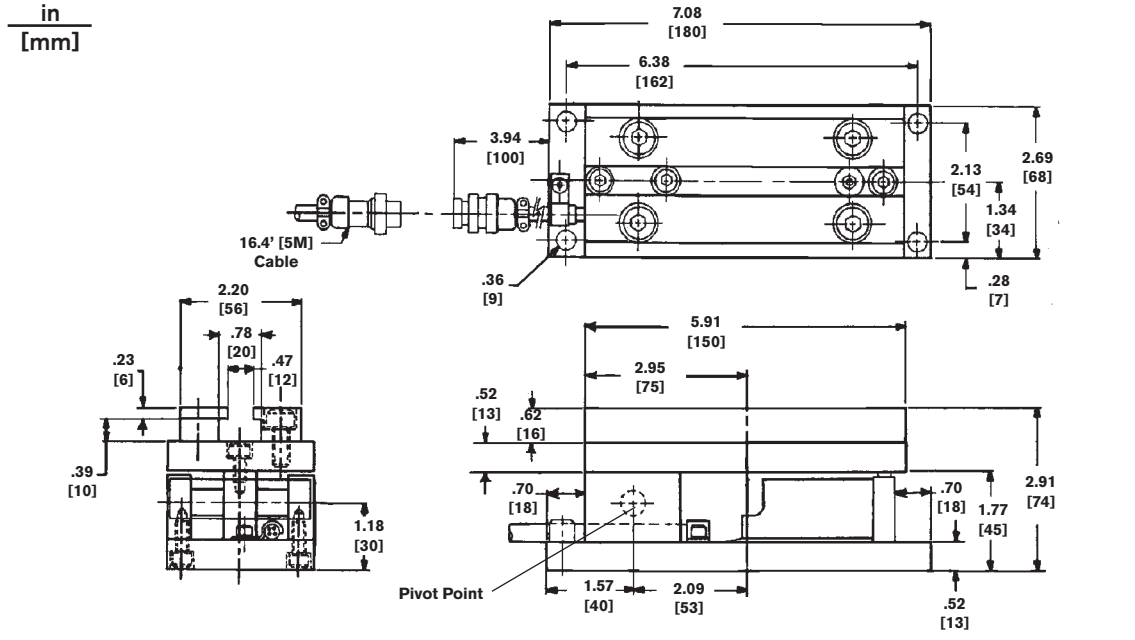

FIGURE 15
MB25

(continued...)

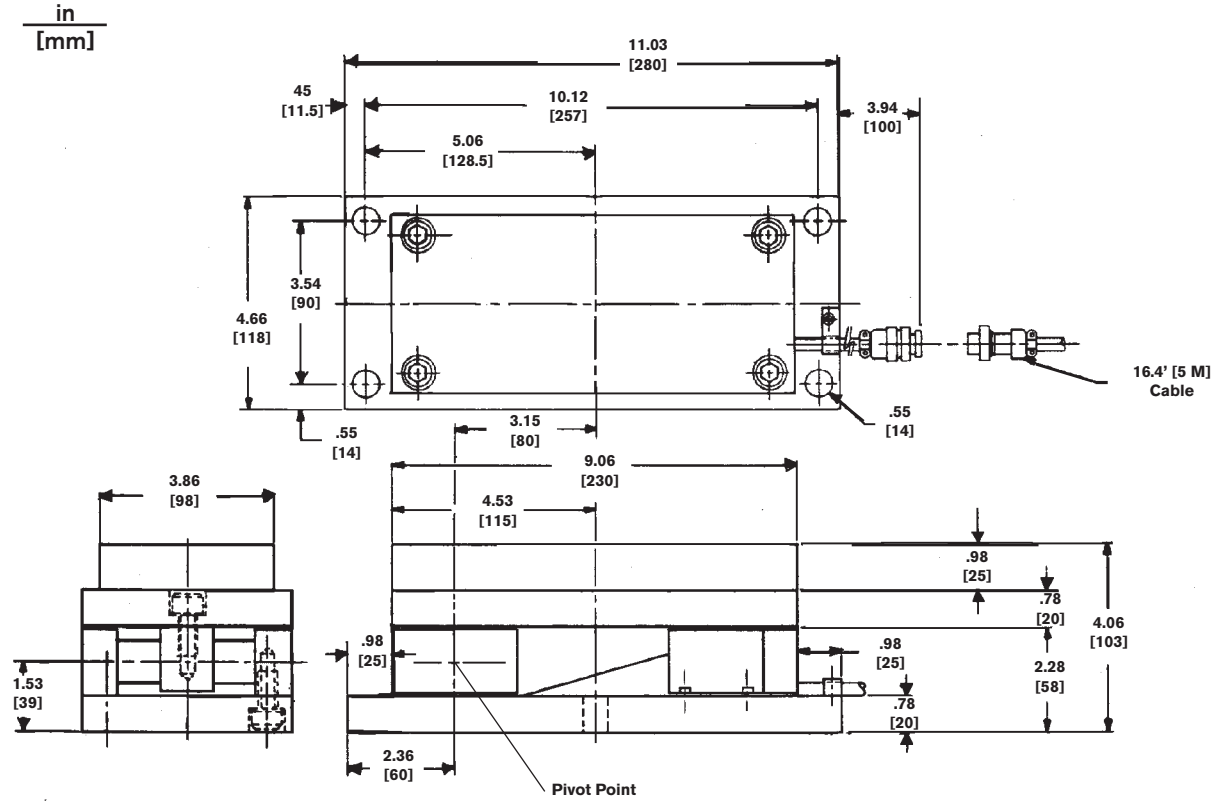

FIGURE 16
MB33

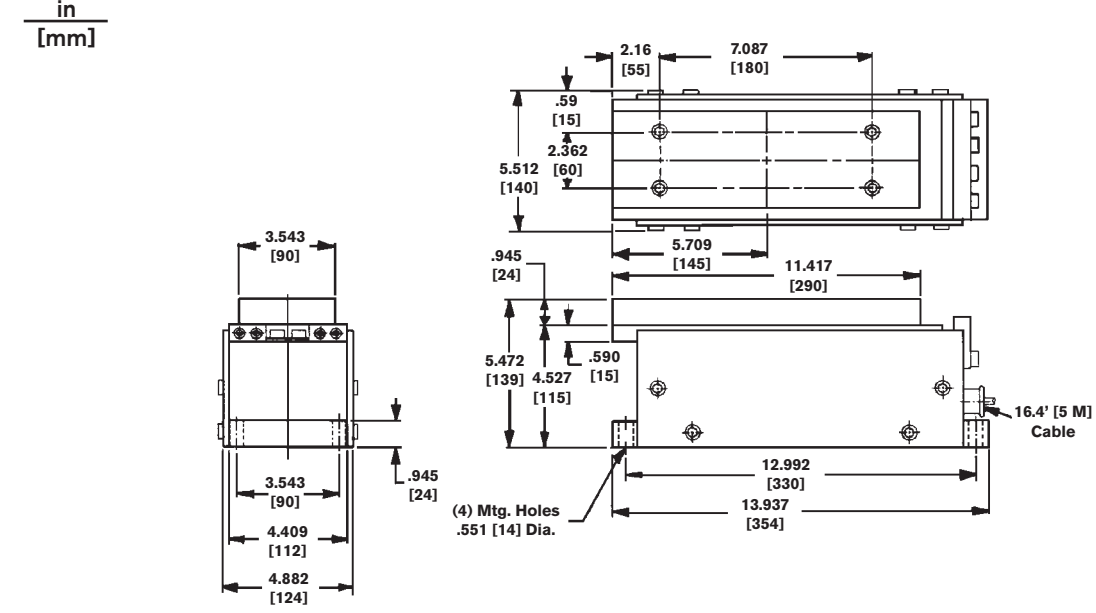

FIGURE 17
MB41

SPECIFICATIONS°

Product Number	912609	912610	911991	911995	911996	911999	911889	912000	911998
Frame Size	MB05B	MB05A	MB11B	MB11A	MB25B	MB25A	MB33B	MB33A	MB41
Load range per sensor									
lb	22	44	22	44	110	220	660	1100	2200
kg	10	20	10	20	50	100	300	500	1000
Tare per sensor									
lb	11	22	11	22	55	110	330	385	770
kg	5	10	5	10	25	50	150	175	350
Accuracy	± 1%	± 1%	± 1%	± 1%	± 1.5%	± 1.5%	± 1.75%	± 1.75%	± 1.75%
Weight lb [kg]	3.3 [1.5]		1.8 [0.8]		7.5 [3.4]		35 [16]		53 [24]
Electrical Data	6 VDC Excitation; 0-400 mV return								
Temperature Range	+14° to +140° F [-10° to +60°C]								

REPLACEMENT CABLE ASSEMBLIES & CONNECTORS

NOTE: All MB Tension Sensors are shipped with 16 ft (5 m) cables standard. Various cable sizes and replacement cable ends are available (See Chart Below.) The MB Tension Sensors have **No Field Serviceable parts**. If service is required, contact your local **Nexen** Web handling distributor.

Part No.	Length	Description
17167	18 in [457 mm]	Extension Cable
17168	48 in [1.2 m]	Extension Cable
2138	16 ft [5m]	Load Cell Cable
8365	30 ft [9m]	Load Cell Cable
9428	50 ft [15m]	Load Cell Cable
9429	75 ft [23m]	Load Cell Cable
9430	100 ft [30m]	Load Cell Cable
2660		Load Cell Pig Tale Cable (Male Connector End)
2661		Load Cell Cable (Female Connector End)

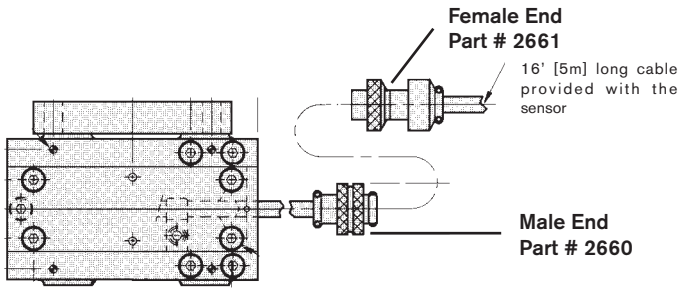

FIGURE 18

WARRANTY

Warranties
Nexen warrants that the Products will be free from any defects in material or workmanship for a period of 12 months from the date of shipment. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

Exclusive Remedy
The exclusive remedy of the Buyer for any breach of the warranties set out above will be, at the sole discretion of Nexen, a repair or replacement with new, serviceably used or reconditioned Product, or issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

Limitation of Nexen's Liability
TO THE EXTENT PERMITTED BY LAW NEXEN SHALL HAVE NO LIABILITY TO BUYER OR ANY OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER
BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE, EVEN IF NEXEN SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For all of the purposes hereof, the term "consequential damages" shall include lost profits, penalties, delay images, liquidated damages or other damages and liabilities which Buyer shall be obligated to pay or which Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Nexen be liable for any amount of damages in excess of amounts paid by Buyer for Products or services as to which a breach of contract has been determined to exist. The parties expressly agree that the price for the Products and the services was determined in consideration of the limitation on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose.

Limitation of Damages
In no event shall Nexen be liable for any consequential, indirect, incidental, or special damages of any nature whatsoever, including without limitation, lost profits arising from the sale or use of the Products.

Warranty Claim Procedures
To make a claim under this warranty, the claimant must give written notice of the alleged defect to whom the Product was purchased from and deliver the Product to same within one year of the date on which the alleged defect first became apparent.

nexen

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